

# The macroeconomic effects of oil supply news: Evidence from OPEC announcements

## Replication materials

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This is the documentation for the replication materials for “*The macroeconomic effects of oil supply news: Evidence from OPEC announcements*”. It contains a data availability statement, detailing the source and accessibility of the data used in the article and the corresponding data citations, as well as software requirements and explanations on how to run the codes to replicate all the results in the article.

## 1 Data

The data that is used in the paper is described in Table 3. The table provides information on the variables used, their source and how they can be retrieved, the coverage, as well as how they are constructed and transformed, and where the data is stored within the replication files. As detailed in the Table, most of the data comes from FRED and Datastream.<sup>1</sup> The daily futures data is stored in the **data** folder under **Oilfutures.xlsx**; the raw monthly and quarterly data can be found in the **rawDataM.xlsx** and **rawDataQ.xlsx** files, respectively.

Table 3 also details how the raw data is transformed prior to the analysis. The transformed series are stored in **.mat** files in the **data** folder. These files contain the following variables:

Table 1: Data structure for variables

Object	Description
<b>data</b>	matrix containing the data in numeric format
<b>varNames</b>	cell containing the labels of the data (as per order of data columns)
<b>dataExo</b>	matrix containing exogenous variables (e.g. constant)
<b>sampleDates</b>	cell containing the sample dates (e.g. 2000M01 or 2000Q1)
<b>sampleDatesNum</b>	vector containing the sample dates in numeric format (e.g. 2000 = 2000M01)

The **instrument** folder contains the monthly and quarterly instruments constructed from the daily futures data under **OilSurprisesMLog.mat** and **OilSurprisesQLog.mat**. It also contains the control series, **OilSurprisesMLogControl.mat**. These files are structured as follows:

Table 2: Data structure for instruments

Object	Description
<b>oilProxiesWTI</b>	matrix containing the daily surprises (front to 12M contract, and PC)
<b>oilProxiesWTIM</b>	matrix containing the monthly instruments
<b>sampleDatesProxy</b>	cell containing the sample dates (e.g. 2000M01 or 2000Q1)
<b>statementInfoM</b>	struct containing info on decision and announcement type
<b>statementMind</b>	vector indicating announcement months

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<sup>1</sup>I thank Refinitiv for the permission to redistribute the relevant extracts of the data under LBS’ Datastream license.

Table 3: Data description, sources, and coverage

Variable	Description	Source	Sample	Trans.
<b>Instrument</b>				
NCLC.hh (PS)	WTI crude oil futures $hh$ -month contract (settlement price)	Datastream	30/03/1983-31/12/2017	100* $\Delta$ log
The instrument and control series can be found in the instrument folder under <code>OilSurprisesMLog.mat</code> and <code>OilSurprisesMLogControl.mat</code> , respectively. The raw daily data is provided in the <code>Oilfutures.xlsx</code> file.				
<b>Baseline variables</b>				
OILPRICE	WTI spot crude oil price (WTISPLC) deflated by U.S. CPI (CPIAUCSL)	FRED	1974M1-2017M12	100*log
EIA1955	World oil production	Datastream	1974M1-2017M12	100*log
OECD+6IP	Industrial production of OECD + 6 (Brazil, China, India, Indonesia, Russia and South Africa) from Baumeister and Hamilton (2019)	Baumeister's webpage	1974M1-2017M12	100*log
OECDSTOCKS	OECD crude oil inventories, calculated based on OECD petroleum stocks (EIA1976) and U.S. crude oil and petroleum stocks (EIA1533, EIA1541), as in Kilian and Murphy (2014)	Datastream/own calculations	1974M1-2017M12	100*log
INDPRO	U.S. industrial production index	FRED	1974M1-2017M12	100*log
CPIAUCSL	U.S. CPI for all urban consumers: all items	FRED	1974M1-2017M12	100*log
The baseline series are stored in the data folder under <code>dataBaseM.mat</code> .				
<b>Additional variables</b>				
<i>Expectations and uncertainty</i>				
BKEXP12M	Oil price expectations (12-month) from Baumeister and Kilian (2017), extended using futures prices	Baumeister's webpage/ own calculations	1983M4-2017M12	100*log
MICH	University of Michigan: inflation expectation	FRED	1981M7-2017M12	Level
CPI6	SPF median inflation expectations (1 year horizon)	Philadelphia FED	1981Q3-2017Q4	Level
VXOCLS	CBOE S&P 100 volatility index: VXO, extended as in Bloom (2009)	FRED/own calculations	1974M1-2017M12	100*log
GPR	Geopolitical risk index from Caldara and Iacoviello (2018)	Iacoviello's webpage	1985M1-2017M12	100*log
<i>Prices</i>				
CPILFESL	U.S. CPI for all urban consumers: all items less food and energy	FRED	1974M1-2017M12	100*log
CPIENGSL	U.S. CPI for all urban consumers: energy	FRED	1974M1-2017M12	100*log
CUSR0000SAN	U.S. CPI for all urban consumers: nondurables	FRED	1974M1-2017M12	100*log
CUSR0000SAD	U.S. CPI for all urban consumers: durables	FRED	1974M1-2017M12	100*log
CUSR0000SAS	U.S. CPI for all urban consumers: services	FRED	1974M1-2017M12	100*log
<i>Activity</i>				
UNRATE	Civilian unemployment rate	FRED	1974M1-2017M12	Level
RPCE	U.S. personal consumption expenditures (PCE), deflated by chain-type price index (PCEPI)	FRED	1974M1-2017M12	100*log
GDPC1	U.S. Real Gross Domestic Product	FRED	1974Q1-2017Q4	100*log
GPDI1	U.S. Real Gross Private Domestic Investment	FRED	1974Q1-2017Q4	100*log
PCECC96	U.S. Real Personal Consumption Expenditures	FRED	1974Q1-2017Q4	100*log
<i>Financial variables</i>				
FF	Effective federal funds rate	FRED	1974M1-2017M12	Level
EBP	Excess bond premium from Gilchrist and Zakrajšek (2012)	Gilchrist's webpage	1974M1-2017M12	Level
SPCOMP	S&P 500 composite price index (monthly average)	Datastream/own calculations	1974M1-2017M12	100*log
<i>Exchange rates and trade</i>				
TWEXBMTH	Trade Weighted U.S. Dollar Index: Broad	FRED	1974M1-2017M12	100*log
TWEXMMTH	Trade Weighted U.S. Dollar Index: Major Currencies	FRED	1974M1-2017M12	100*log
–	Bilateral exchange rates, domestic currency per U.S. dollar	IFS	1974M1-2017M12 RUS starts 1995M6	100*log
USTOTPRCF	U.S. terms of trade	Datastream	1974M1-2017M12	100*log
USBALGDSB	U.S. merchandise trade balance, as a share of nominal GDP (GDP from FRED)	Datastream/FRED	1974Q1-2017Q4	Level
The monthly and quarterly series are stored in the data folder under <code>dataExtM.mat</code> and <code>dataExtQ.mat</code> , respectively. The monthly series used in the larger VAR for the variance decomposition are also included in <code>dataQuantM.mat</code> . The untransformed data can be found in the <code>rawDataM.xlsx</code> and <code>rawDataQ.xlsx</code> files.				

The announcement and control dates are in the `OPECannouncements.xlsx` and `OPECplacebos.xlsx` files in the `data` folder. Finally, Table 4 describes the additional data used in the online appendix.

Table 4: Description of data in online appendix

Variable	Description	Source	Sample	Trans.
<i>Wider effects</i>				
RDNRGRC1M027SBEA	U.S. PCE energy goods and services (DNRGRC1M027SBEA), deflated by DNR-GRG3M086SBEA	FRED	1974M1-2017M12	100*log
RPCEND	U.S. PCE nondurable goods (PCEND), deflated by DNDGRG3M086SBEA	FRED	1974M1-2017M12	100*log
RPCEDG	U.S. PCE durable goods (PCEDG), deflated by DDURRG3M086SBEA	FRED	1974M1-2017M12	100*log
RPCES	U.S. PCE services (PCES), deflated by DSERRG3M086SBEA	FRED	1974M1-2017M12	100*log
OILGSUS	Oil & Gas stock price index (monthly average)	Datastream/own calculations	1974M1-2017M12	100*log
ELECTUS	Electricity stock price index (monthly average)	Datastream/own calculations	1974M1-2017M12	100*log
MNINGUS	Mining stock price index (monthly average)	Datastream/own calculations	1974M1-2017M12	100*log
AUTOSUS	Automobiles stock price index (monthly average)	Datastream/own calculations	1974M1-2017M12	100*log
RTAILUS	Retail stock price index (monthly average)	Datastream/own calculations	1974M1-2017M12	100*log
TRLESUS	Travel & Leisure stock price index (monthly average)	Datastream/own calculations	1974M1-2017M12	100*log
These series are also stored in <code>dataExtM.mat</code> and <code>dataExtStocksM.mat</code> .				
<i>Sensitivity</i>				
LLCC.hh (PS)	Brent crude oil futures <i>hh</i> -month contract (settlement price)	Datastream	24/06/1983-31/12/2017	100*Δlog
BRENTP	Brent spot crude oil price (DCOILBREUTEU, extended using POILBREUSD and WTISPLC) deflated by U.S. CPI (CPIAUCSL)	FRED/own calculations	1974M1-2017M12	100*log
REFINER COST	U.S. refiners acquisition cost of imported crude oil (USCOCOIMA) deflated by U.S. CPI (CPIAUCSL)	Datastream	1974M1-2017M12	100*log
GLOBALACT	Kilian's (2009) index of global real economic activity	Kilian's webpage	1974M1-2015M12	Level
The instrument is stored in <code>OilSurprisesMLogBrent.mat</code> . The transformed data is stored in <code>dataBrentM.mat</code> and <code>dataAppendixM.mat</code> .				

The corresponding data references can be found at the end of this document. The series names/mnemonics are also listed there in brackets [ ].

## 2 Replication

**Software and computational requirements.** We use Matlab for the analysis in the paper. All codes were written and tested in Matlab R2019b on a personal computer. On a machine with an Intel Xeon E-2176M @ 2.70GHz (2712 Mhz, 6 Core(s), 12 Logical Processors) and 32 GB EEC RAM, the codes for the main analysis (`mainReplication.m`) take about 1 hour 20 minutes to run while the codes for the appendix (`mainReplicationAppendix.m`) take around 1 hour.

**Data transformations and preliminaries.** Section 1 together with the data references at the end of the document give detailed information where and how the raw data can be retrieved. As stated above, all raw data is provided in the `rawDataM.xlsx` and `rawDataQ.xlsx` files in the `data` folder. The series in this file that involve own calculations are constructed in the `ConstructCustomSeries.xlsx` file as well as the `StockIndices.xlsm` file in the `data/prelims` folder.<sup>2</sup> The transformed series used in the analysis are constructed using the `transformDataM.m` and `transformDataQ.m` routines. In the `data/prelims` folder, there is also the `Oilfutures.xlsm`

<sup>2</sup>The seasonal adjustment of the oil inventory series is performed in the EViews file `oecdstockssa.wf1`. The raw daily data underlying the stock indices can be found in the `StockIndices.xlsm` file. Note that two series (OILGSDUS and MNINGUS) have been discontinued and are no longer provided by Datastream.

file that can be used to pull/update the futures data from Datastream.<sup>3</sup>

**Replication codes.** The replication codes are located in the `codes` folder. All figures and tables in the paper can be generated by running the `mainReplication.m` file. Auxiliary functions are included in `codes/auxfiles`. The results are all saved in the `results` folder, as `.eps` and `.pdf` files for figures and `.tex` files for tables. Note that the codes are written using relative paths, so everything should run provided that the current working directory is the `codes` folder. Table 5 provides more details for each step of the analysis. Detailed descriptions of the codes are given in the preambles and comments of the codes.

Table 5: Summary of replication files

Step	Code and Output
Preliminaries 1	<p>Transform the data</p> <ul style="list-style-type: none"> <li>• Codes: <code>transformDataM.m</code> and <code>transformDataQ.m</code> in <code>data</code> folder</li> <li>• Input: <code>rawDataM.xlsx</code> and <code>rawDataQ.xlsx</code> in <code>data</code> folder</li> <li>• Output: <ul style="list-style-type: none"> <li>– Monthly files: <code>dataBaseM.mat</code>, <code>dataExtM.mat</code>, <code>dataQuantM.mat</code> in <code>data</code> folder and <code>dataAppendixM.mat</code>, <code>dataBHM.mat</code>, <code>dataBrentM.mat</code>, <code>dataExtStocksM.mat</code>, <code>dataGrangerM.mat</code>, <code>dataKilianM.mat</code>, <code>dataStationaryM.mat</code> in <code>data/appendix</code></li> <li>– Quarterly files: <code>dataBaseQ.mat</code>, <code>dataExtQ.mat</code> in <code>data</code></li> </ul> </li> </ul>
Preliminaries 2	<p>Construct the instrument and control series</p> <ul style="list-style-type: none"> <li>• Codes: <code>createOilSurprisesWindow.m</code>, <code>createOilSurprisesWindowControl.m</code> in <code>instrument</code> folder</li> <li>• Input: <code>Oilfutures.xlsx</code>, <code>OPECannouncements.xlsx</code>, <code>OPECplacebos.xlsx</code> in <code>data</code> folder and <code>OPECreports.xlsx</code> in <code>data/appendix</code></li> <li>• Output: <ul style="list-style-type: none"> <li>– Instruments: <code>OilSurprisesMLog.mat</code>, <code>OilSurprisesMLogRefined.mat</code>, and <code>OilSurprisesQLog.mat</code></li> <li>– Controls: <code>OilSurprisesMLogControl.mat</code></li> </ul> </li> </ul>

<sup>3</sup>To be able to do so requires Datastream 5.1. To avoid conflicts in Matlab with Datastream VBA references, a copy of the file is saved in the `data` folder in `.xlsx` format.

Step	Code and Output
Figures 1 and 2 (Figure A.1, Table A.2)	<ul style="list-style-type: none"> <li>• Code: <code>s01_figures1_2.m</code></li> <li>• Input: <code>OilSurprisesMLog.mat</code>, <code>OilSurprisesMLog.mat</code> in <code>instrument</code> folder</li> <li>• Output: <code>figure1.eps</code>, <code>figure2.eps</code> Also generates <code>figurea1.pdf</code> and <code>tablea2.pdf</code> for appendix</li> </ul>
Table 1	<ul style="list-style-type: none"> <li>• Code: <code>s02_table1.m</code></li> <li>• Input: <code>instrument/OilSurprisesMLog.mat</code>, <code>data/dataBaseM.mat</code></li> <li>• Output: <code>table1.tex</code></li> </ul>
Figures 3 and 5 (Figure B.1)	<ul style="list-style-type: none"> <li>• Code: <code>s03_figures3_5.m</code></li> <li>• Input: <code>instrument/OilSurprisesMLog.mat</code>, <code>data/dataBaseM.mat</code></li> <li>• Output: <code>figure3.pdf</code>, <code>figure5.pdf</code> Also generates <code>figureb1.pdf</code> for appendix</li> </ul>
Figure 4a (Figure A.3)	<ul style="list-style-type: none"> <li>• Code: <code>s04_figure4a.m</code></li> <li>• Input: <code>instrument/OilSurprisesMLogControl.mat</code>, <code>data/dataBaseM.mat</code></li> <li>• Output: <code>figure4a.pdf</code>. Also generates <code>figurea3.pdf</code> for appendix</li> </ul>
Figure 4b	<ul style="list-style-type: none"> <li>• Code: <code>s05_figure4b.m</code></li> <li>• Input: <code>instrument/OilSurprisesMLog.mat</code>, <code>data/dataBaseM.mat</code></li> <li>• Output: <code>figure4b.pdf</code></li> </ul>

Step	Code and Output
Figures 6, 8, 9a, 10 and 11 (Figures A.7, A.8, A.15)	<ul style="list-style-type: none"> <li>• Code: <code>s06_figures6_8_9a_10_11.m</code></li> <li>• Input: <code>instrument/OilSurprisesMLog.mat</code>, <code>dataBaseM.mat</code>, <code>dataExtM.mat</code> and <code>dataExtStocksM.mat</code> in data folder.</li> <li>• Output: <code>figure6.pdf</code>, <code>figure8.pdf</code>, <code>figure9a.pdf</code>, <code>figure10.pdf</code>, <code>figure11.pdf</code>. Also generates <code>figurea7.pdf</code>, <code>figurea8.pdf</code> and <code>figurea15.pdf</code> for appendix</li> </ul>
Figures 7, 9b and 12 (Figure A.31)	<ul style="list-style-type: none"> <li>• Code: <code>s07_figures7_9b_12.m</code></li> <li>• Input: <code>instrument/OilSurprisesQLog.mat</code>, <code>dataBaseQ.mat</code> and <code>dataExtQ.mat</code> in data folder</li> <li>• Output: <code>figure7.pdf</code>, <code>figure9b.pdf</code>, <code>figure12.pdf</code>. Also generates <code>figurea31.pdf</code> for appendix</li> </ul>
Table 2	<ul style="list-style-type: none"> <li>• Code: <code>s08_table2.m</code></li> <li>• Input: <code>instrument/OilSurprisesMLog.mat</code>, <code>data/dataQuantM.mat</code></li> <li>• Output: <code>table2.tex</code></li> </ul>

In the folder `codes/appendix`, I also include the codes to reproduce the results in the on-line appendix. These codes are detailed in Table 6. Other relevant files are stored in the `appendix` subfolders. All figures and tables in the appendix can be generated by running the `mainReplicationAppendix.m` file.

Table 6: Summary of appendix replication files

Step	Code and Output
Preliminaries A	Construct the instrument using Brent <ul style="list-style-type: none"> <li>• Codes: <code>createOilSurprisesWindowBrent.m</code> in <code>instrument/appendix</code> folder</li> <li>• Input: <code>Oilfutures.xlsx</code> in <code>data</code> folder and <code>OPECannouncementsEU.xlsx</code> in <code>data/appendix</code></li> <li>• Output: <code>OilSurprisesMLogBrent.mat</code></li> </ul>

Table A.1

- Code: `a01_tablea1.m`
- Input: `OPECannouncements.xlsx` in `data` and `FEDannouncements.xlsx`, `macronewskey_updated.xls` in `data/appendix`. The latter two files were constructed by updating information contained in the replication files of Kilian and Vega (2011) using information from Bloomberg.
- Output: `tablea1.tex`

Table A.3

- Code: `a02_tablea3.m`
- Input: `OilSurprisesMLog.mat`, `OilSurprisesQLog.mat` and `shockseries.xlsx`. The latter file was constructed by compiling information from the replication files by Caldara, Cavallo, and Iacoviello (2019), Kilian (2009), Stock and Watson (2012) and Piffer and Podstawski (2017) as well as information from Christiane Baumeister's webpage (see Data References for more information).
- Output: `tablea3.tex`

Figure A.2

- Code: `a03_figurea2a.m`, `a04_figurea2b.m`
- Input: `OilSurprisesMLog.mat`, `OilSurprisesMLogControl.mat`, and `dataBaseM.mat`
- Output: `figurea2a.pdf`, `figurea2b.pdf`

Step	Code and Output
Figure A.4	<ul style="list-style-type: none"> <li>• Code: <code>a05_figurea4a.m</code>, <code>a06_figurea4b.m</code></li> <li>• Input: <code>OilSurprisesMLog.mat</code>, and <code>dataBaseM.mat</code></li> <li>• Output: <code>figurea4a.pdf</code>, <code>figurea4b.pdf</code></li> </ul>
Figure A.5	<ul style="list-style-type: none"> <li>• Code: <code>a07_figurea5.m</code></li> <li>• Input: <code>OilSurprisesMLog.mat</code>, <code>OilSurprisesMLogControl.mat</code>, and <code>dataBaseM.mat</code></li> <li>• Output: <code>figurea5.pdf</code></li> </ul>
Figure A.6	<ul style="list-style-type: none"> <li>• Code: <code>a08_figurea6.m</code></li> <li>• Input: <code>OilSurprisesMLog.mat</code>, <code>OilSurprisesMLogControl.mat</code>, and <code>dataBaseM.mat</code></li> <li>• Output: <code>figurea6.pdf</code></li> </ul>
Figure A.9	<ul style="list-style-type: none"> <li>• Code: <code>a09_figurea9.m</code></li> <li>• Input: <code>OilSurprisesMLog.mat</code>, and <code>dataBaseM.mat</code>, <code>dataExtM.mat</code></li> <li>• Output: <code>figurea9.pdf</code></li> </ul>
Figure A.11	<ul style="list-style-type: none"> <li>• Code: <code>a10_figurea11.m</code></li> <li>• Input: <code>OilSurprisesMLogRefined.mat</code>, and <code>dataBaseM.mat</code></li> <li>• Output: <code>figurea11.pdf</code></li> </ul>
Figure A.12	<ul style="list-style-type: none"> <li>• Code: <code>a11_figurea12.m</code></li> <li>• Input: <code>OilSurprisesMLog.mat</code>, and <code>dataBaseM.mat</code></li> <li>• Output: <code>figurea12.pdf</code></li> </ul>

Step	Code and Output
Figure A.13	<ul style="list-style-type: none"> <li>• Code: <code>a12_figurea13.m</code></li> <li>• Input: <code>OilSurprisesMLog.mat</code>, <code>KilianInstruments.mat</code>, and <code>dataBaseM.mat</code>. The series in the <code>KilianInstruments</code> file cannot be shared publicly because it was privately shared with me by another researcher.</li> <li>• Output: <code>figurea13.pdf</code></li> </ul>
Figure A.14	<ul style="list-style-type: none"> <li>• Code: <code>a13_figurea14.m</code></li> <li>• Input: <code>OilSurprisesMLog.mat</code>, and <code>dataBaseM.mat</code>.</li> <li>• Output: <code>figurea14.pdf</code></li> </ul>
Figure A.16	<ul style="list-style-type: none"> <li>• Code: <code>a14_figurea16.m</code></li> <li>• Input: <code>OilSurprisesMLog.mat</code>, and <code>dataBaseM.mat</code>.</li> <li>• Output: <code>figurea16.pdf</code></li> </ul>
Figure A.17	<ul style="list-style-type: none"> <li>• Code: <code>a15_figurea17.m</code></li> <li>• Input: <code>OilSurprisesMLogBrent.mat</code>, and <code>dataBrentM.mat</code>.</li> <li>• Output: <code>figurea17.pdf</code></li> </ul>
Figure A.18	<ul style="list-style-type: none"> <li>• Code: <code>a16_figurea18.m</code></li> <li>• Input: <code>OilSurprisesMLog.mat</code>, and <code>dataBaseM.mat</code>, <code>dataAppendixM.mat</code>.</li> <li>• Output: <code>figurea18.pdf</code></li> </ul>

Step	Code and Output
Figure A.19	<ul style="list-style-type: none"> <li>• Code: <code>a17_figurea19.m</code></li> <li>• Input: <code>OilSurprisesMLog.mat</code>, and <code>dataBaseM.mat</code>, <code>dataAppendixM.mat</code>.</li> <li>• Output: <code>figurea19.pdf</code></li> </ul>
Figures A.20, A.21, A.22, A.23	<ul style="list-style-type: none"> <li>• Code: <code>a18_figuresa20_21_22_23.m</code></li> <li>• Input: <code>OilSurprisesMLog.mat</code>, and <code>dataBaseM.mat</code>.</li> <li>• Output: <code>figurea20.pdf</code>, <code>figurea21.pdf</code>, <code>figurea22.pdf</code>, and <code>figurea23.pdf</code></li> </ul>
Figure A.24	<ul style="list-style-type: none"> <li>• Code: <code>a19_figurea24.m</code></li> <li>• Input: <code>OilSurprisesMLog.mat</code>, and <code>dataStationaryM.mat</code>.</li> <li>• Output: <code>figurea24.pdf</code></li> </ul>
Figure A.25	<ul style="list-style-type: none"> <li>• Code: <code>a20_figurea25.m</code></li> <li>• Input: <code>OilSurprisesMLog.mat</code>, and <code>dataKilianM.mat</code>.</li> <li>• Output: <code>figurea25.pdf</code></li> </ul>
Figure A.26	<ul style="list-style-type: none"> <li>• Code: <code>a21_figurea26.m</code></li> <li>• Input: <code>OilSurprisesMLog.mat</code>, and <code>dataBHM.mat</code>.</li> <li>• Output: <code>figurea26.pdf</code></li> </ul>

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Step	Code and Output
Figures A.27, A.28, A.29, A.30	<ul style="list-style-type: none"><li>• Code: <code>a22_figuresa27_28_29_30.m</code></li><li>• Input: <code>OilSurprisesMLog.mat</code>, and <code>dataBaseM.mat</code>.</li><li>• Output: <code>figurea27.pdf</code>, <code>figurea28.pdf</code>, <code>figurea29.pdf</code>, and <code>figurea30.pdf</code></li></ul>

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